Determination of dynamic soil parameters using a novel CPT-based seismic tomographic system

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The cross-hole survey is a common geophysical method to determine soil dynamic properties of soils with high resolution between boreholes. Regardless of the availability of drill holes, the Direct Push technology allows multi-level recordings of various geotechnical, geophysical and geochemical parameters with simultaneous sampling.

The spatial distribution of geotechnical parameters between different CPT locations is often estimated by using various interpolation methods. However, the reliability of the predicted structures depends significantly on the heterogeneity of the local geology as well as on the distance between the CPT locations and therefore may be questionable in many cases. The uncertainty of the interpolation can be reduced by applying "cross-hole" seismic tomography between the CPT locations. In the frame of the R&D project CPTTOMO a CPT-based seismic tomography system is under development. By integrating three-component geophones at different CPT rod levels as well as P- and S-wave sources in small-bore Direct-Push CPT rods seismic measurements shall be available between two near-by CPT locations.

This presentation describes the combination of a Direct-Push system and S-wave cross-hole measurements as a cost-effective alternative to standard investigation techniques and as a tool to support geotechnical engineers to predict dynamic soil parameters. On the other hand, it introduces this novel combined system and highlights the potential of multi-dimensional images for geotechnical subsurface investigation and stability assessment.